

(12) UK Patent Application (19) GB (11) 2 294 085 (13) A

(43) Date of A Publication 17.04.1996

(21) Application No 9520800.5

(22) Date of Filing 11.10.1995

(30) Priority Data

(31) 9420467

(32) 11.10.1994

(33) GB

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(51) INT CL⁶

E05C 9/04

(52) UK CL (Edition O)

E2A AAK A120 A138 A160 A190 A192 A420 A421

(56) Documents Cited

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EP 0602323 A1

(58) Field of Search

UK CL (Edition N) E2A AAK AMXJ

INT CL⁶ E05C 9/04 9/08 9/10

ONLINE: WPI

(54) **Shoot bolt fastening for windows or doors**

(57) A shoot bolt fastening for one or two bolts, and for mounting at an edge of a window or door, has in a housing 1 a pinion 4 rotatable by a handle (not shown), which may be lockable, gears 5 and 6 in mesh with the pinion 4 and linearly movable members 7 and 8 which are connected by pins 26 and slots 28 to the respective gears 5 and 6 and are connected to bolts 9 and 10 so that rotation of the pinion 4 slides the slide members 7 and 8 to move the bolts 9 and 10, in opposite directions with respect to one another, between retracted and shot positions. The gears 5 and 6 may only be partially toothed and preferably a quarter turn of the pinion 4 is sufficient for the bolts 9 and 10 to be moved fully between their two positions.

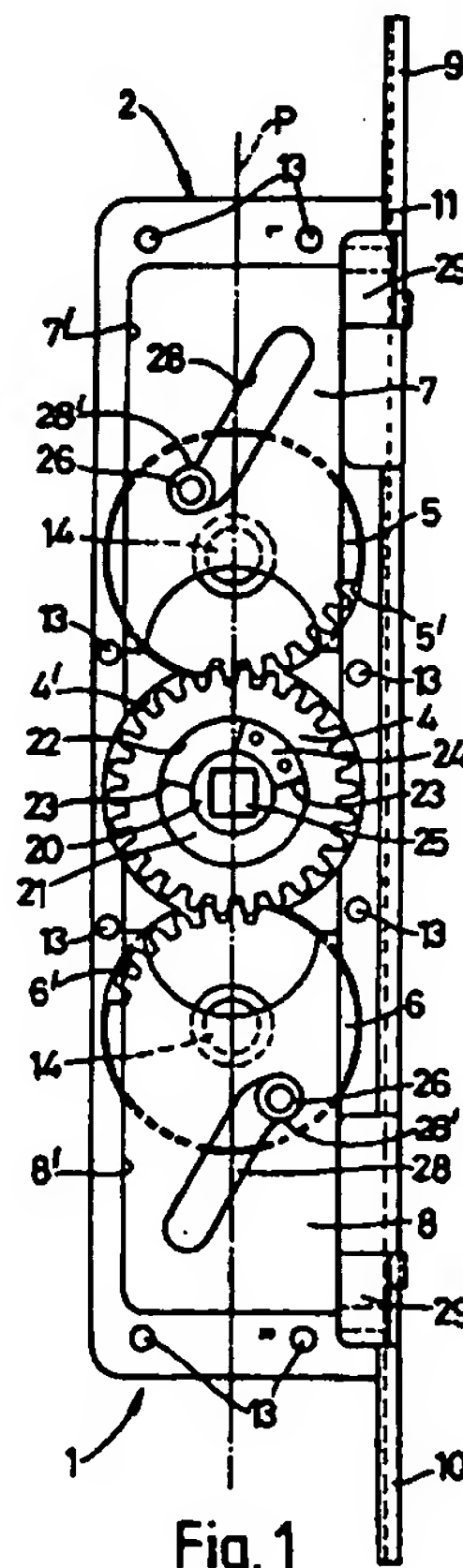


Fig. 1

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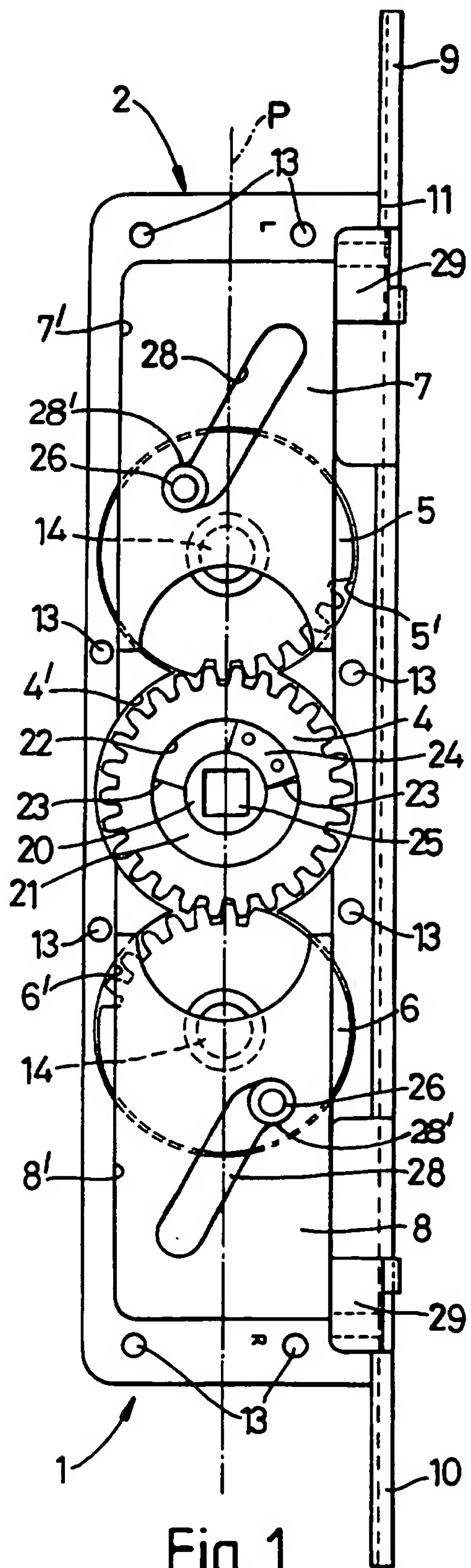


Fig. 1

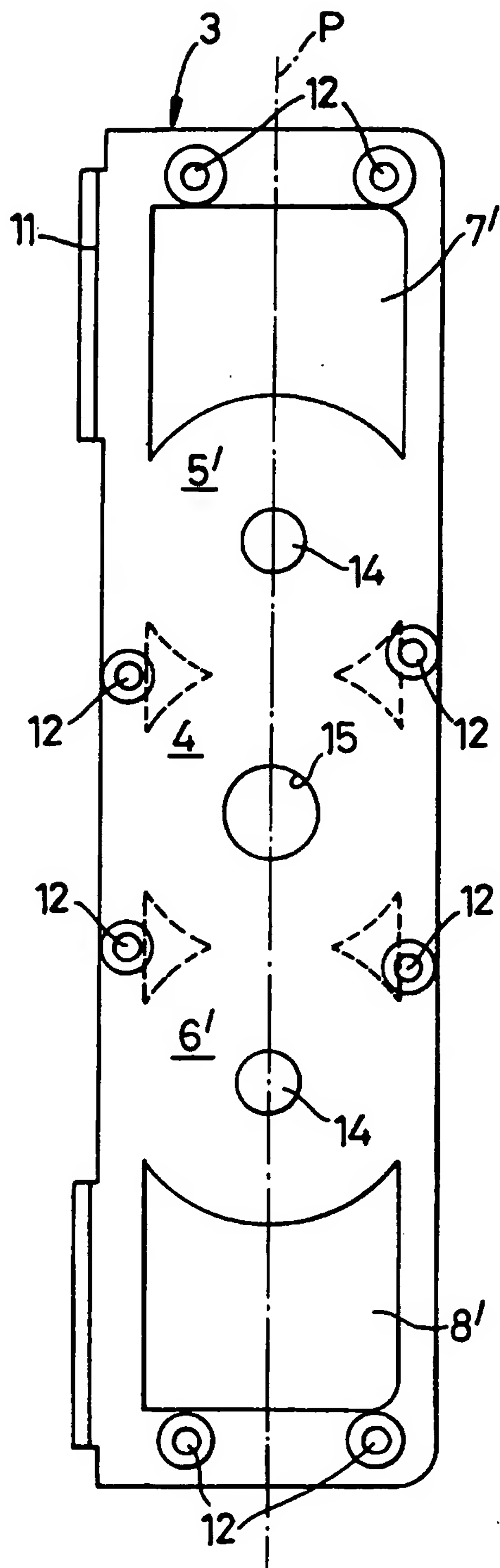


Fig. 2

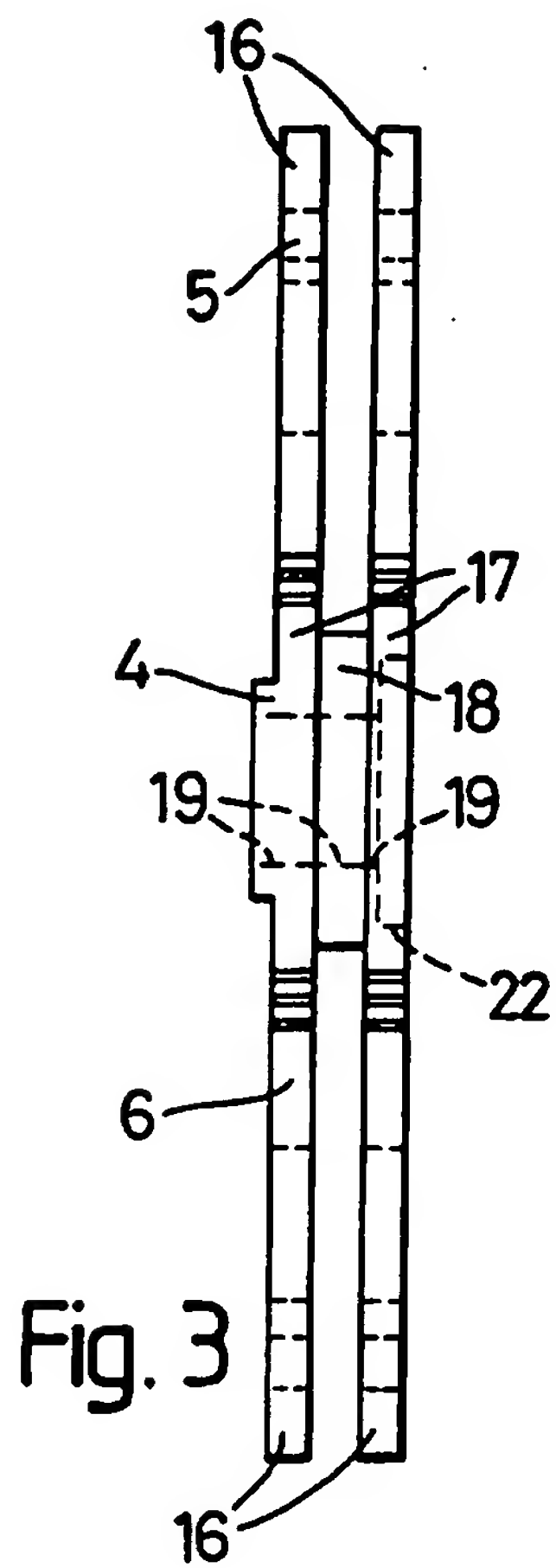
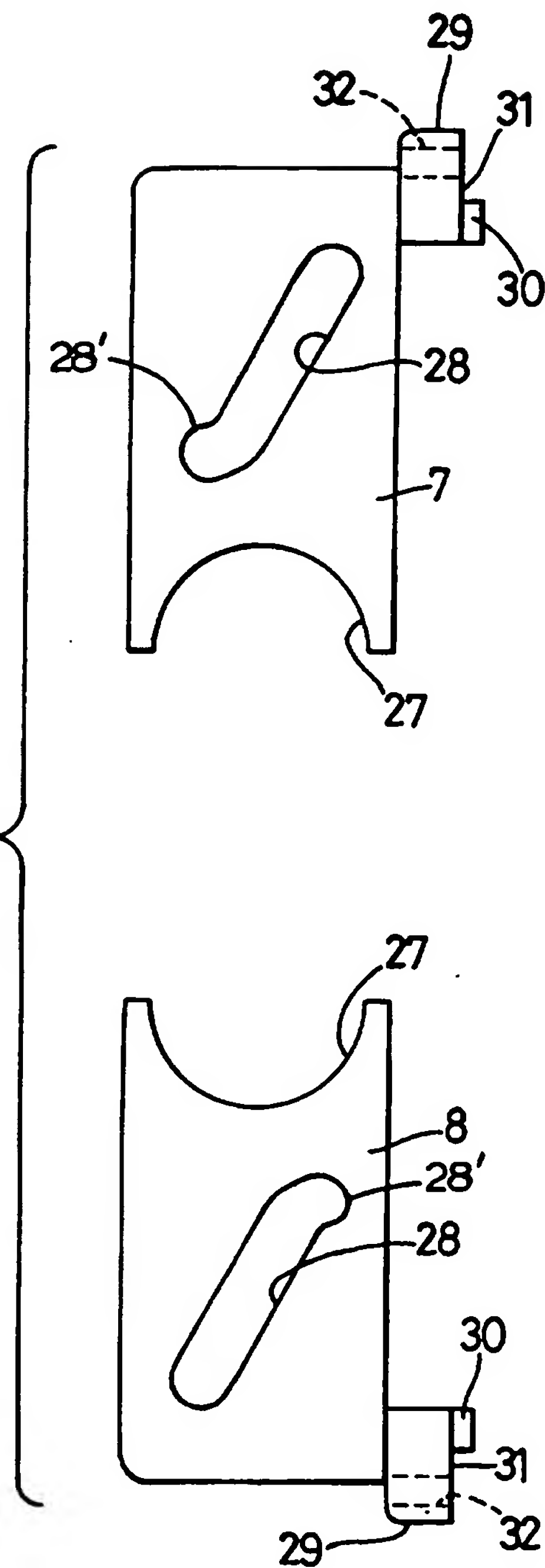


Fig. 4



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JC09 Rec'd PCT/PTO 12 OCT 2009
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SHOOT BOLT FASTENING FOR WINDOWS OR DOORS

This invention relates to a shoot bolt fastening for windows or doors in which at least one bolt adapted to be mounted at an edge of a window or door is caused to be moved linearly between retracted and shot positions by means of a rotatable operating handle. Such a fastening is hereinafter referred to as a "shoot-bolt fastening of the kind described".

A shoot bolt fastening of the kind described may be used on a sliding or hinged window or door. The or each bolt may be arranged to engage with a keeper at a top or bottom edge and/or a side edge of a window or door. The fastening may be applied to a single window or door or to a double, or multiple, window or door installation and the fastening may be applied to a live or slave window or door.

Whatever the installation, it is generally desirable for the linear movement of the or each bolt between the retracted and shot positions to be achieved without excessive rotation of the operating handle. Ideally the operating handle should not need to be rotated through more than a quarter turn to move the or each bolt between the two positions.

It is an aim of the present invention to enable these requirements to be met.

According to the present invention a shoot bolt fastening of the kind described is provided which comprises a housing adapted to be secured at an edge of a window or door, a pinion mounted in the housing and rotatable by the operating handle, a gear rotatably mounted in the housing in mesh with the pinion, a slide

member linearly slidable relative to the housing to which the bolt, or one of the bolts, is connected for linear movement therewith, and a pin and slot interconnection between the gear and slide member whereby rotation of the gear by the pinion slides the slide member to move the, or the respective, bolt between the retracted and shot positions.

Preferably the relationship between the pinion and gear is such that the gear is rotated sufficiently by a quarter turn of the pinion for the resultant linear movement of the slide member to move the, or the respective, bolt fully between the retracted and shot positions. It is generally desirable for the full extent of the linear movement of the, or the respective, bolt between the two positions to be 25mm or more for good security engagement between the bolt and its keeper.

The pinion and gear may have a common pitch diameter for their meshing teeth. They may be completely or only partially toothed around their peripheries. Each may have duplicate, axially spaced, sets of teeth to increase the contact between the pinion and gear and enhance the strength of the mechanism. In such an arrangement the slide member may slide between the duplicate sets of teeth of the gear, and the pin and slot interconnection may be between the two parts of the gear containing the duplicate sets of teeth and the slide member.

The pinion and gear may be made of metal, for example brass, or they may be moulded from a suitable plastics material, for example a nylon material.

The housing and slide member may also be made of metal or plastics material.

Conveniently the slide member is housed within the housing, a guide or guides being provided to guide the member in its linear movement. The, or the respective, bolt or an associated member may extend into the housing for connection to the slide member, or alongside part of the housing where communication is provided between the slide member and the bolt or associated member.

The pin of the pin and slot interconnection may comprise a pin, stud or like element fixed to, or possibly formed integrally with, one of the components that are interconnected, and the slot may be a through opening, recess or groove in the other component. Preferably the pin is on the gear and the slot is in the slide member. In the arrangement mentioned above in which the gear has duplicate sets of teeth and the slide member slides between the two parts containing the teeth, the slot is preferably a through opening in the slide member and the pin extends between the two parts of the gear and through the slot. The slot is most effectively disposed diagonally to the direction of linear movement of the slide member and is symmetrically intersected, or substantially so, by a plane containing the rotational axes of the pinion and gear. The inclination of the slot and its position are selected to provide easy sliding engagement between the pin and slot throughout the turning of the gear and the linear travel of the slide member. The slot may have a lateral recess in which the pin engages when the bolt has been moved to the shot position, thereby to resist retraction of the bolt other than by turning the operating handle.

Two bolts may be provided for engagement with keepers adjacent to opposite, top and bottom or side, edges of a window or door to which the fastening is fitted for use, or adjacent to spaced positions along the same, upright or side, edge of the window or door. There can be a gear and slide member for each bolt at opposite sides of the pinion which meshes with both gears so as to rotate them in opposite directions for linearly moving the slide members simultaneously in opposite directions. Both bolts are therefore operated in one turning action of the handle.

The handle may be spring-loaded to a neutral position from which it has to be turned to move the bolt or bolts from the retracted position to the shot position, and vice versa. It may be adapted to be locked against turning.

For use of the fastening on a slave window or door of a pair of co-operating windows or doors, for example French windows, the or each bolt may be adapted to be locked in the shot position by a bolt or bolts of a lockable shoot bolt fastening of the kind described on a live window or door of the pair. Thus locking the one fastening renders the bolts of both fastenings immovable. The fastening on the live window or door may be a fastening in accordance with the present invention which has a lockable handle.

The fastening may be used on metal, timber or plastics windows or doors.

An embodiment of the present invention will now be described by way of example only with reference to the accompanying drawings, in which,

Figure 1 is a side view of a shoot bolt fastening in accordance with the present invention with part of a housing of the fastening removed;

Figure 2 is an inside view of the removed part of the housing;

Figure 3 is an edge view of a pinion and gears of the fastening, and

Figure 4 is a side view of two slide members of the fastening.

Referring to Figures 1 and 2, the fastening comprises a housing 1, made up of two mating, body and cover shells 2, 3, a pinion 4, two gears 5, 6, two slide members 7, 8 and two shoot bolts 9, 10. There is also a lever handle, not shown, which is connected to the pinion 4 to rotate it.

The housing 1 is of a slab-like oblong rectangular shape with its front 11 at one of the longer edges of the slab form. The body and cover shells 2, 3 are machined from metal stock and fit together on a central plane parallel to the two wider opposite sides of the housing. Plain bore holes 12 in the cover shell 3 and registering screw-threaded holes 13 in the body shell 2 are engaged by screws, not shown, to secure the shells together. Registering and overlapping circular recesses 4', 5', 6' are formed in the shells respectively to receive and locate the pinion 4 and two gears 5, 6 rotatably in the housing. The pinion 4 is positioned centrally in the housing with the rotational axis in a central longitudinal plane P parallel to the front 11, and the gears are at diametrically opposite sides of the pinion 4, their

rotational axes also in plane P. At the centres of the gear recesses 5', 6' there are journal formations 14 on which the gears 5, 6 rotate. A plain bore hole 15 in the cover shell 3 opens centrally into the pinion recess 4' of that shell. Further registering recesses 7, 8' at opposite ends of the shells, beyond the gear recesses 5', 6', receive and guide the slide members 7, 8 for linear sliding movement longitudinally of the housing, parallel to the front 11. The front 11 is open but otherwise the housing is closed when the two shells are secured together.

Pinion 4 and the two gears 5, 6 are all of wheel form and of the same diameter. Each has two similarly axially spaced toothed portions, the pinion 4 meshing with the two gears 5, 6 as shown in Figure 3. The two toothed portions 16 of each of the two gears 5, 6 are separate and rest on opposite side faces of the respective slide members 7, 8 but are retained in co-axial relationships by the gear recesses 5', 6' and the journal formations 14. Between and fixed to the two toothed portions 17 of the pinion is an intermediate collar 18 which spaces them apart and is of smaller diameter. Those portions and the collar 18 have co-axial bores 19 of a common diameter in which a hub 20, Figure 1, is rotatably engaged. A radially enlarged head 21 of the hub seats in a circular recess 22 in an outer face of the toothed portion 17 remote from the collar 18. A segment of the head 21 is cut away to present two angularly spaced, radial, abutment faces 23. Between the abutment faces 23 a stop 24 is fixed in the recess 22 which extends arcuately for a shorter distance than the angular spacing apart of the abutment faces. The arrangement of the abutment faces and the stop 24 allows 90° of

relative angular movement between the hub and the pinion.

A square-section axial bore 25 through the hub 20 is engaged by a standard square section spindle, not shown, of the lever handle.

The lever handle is spring-loaded in a known manner to a neutral, horizontal, position.

Toothed portions 17 of the pinion are fully toothed around their peripheries, whereas the toothed portions 16 of the two gears 5, 6 are toothed only along a 90° arc of their peripheries. The gears are therefore limited to 90° of rotary movement in opposite directions. All the toothed portions have involute gear teeth for easy meshing. By virtue of the relative angular movement allowed between the hub and the pinion by the abutment faces 23 and stop 24, the handle is able to be turned through 180°, 90° to either side of its neutral position, but it only turns the pinion through 90° of that movement in each direction for turning the gears. Each gear 5, 6 has a pin 26, Figure 1, which is fixed to and extends between the two toothed portions 16 of the gear. The pin 26 is parallel to the rotational axis of the gear, on a diameter of the toothed portions which equally bisects the arc containing the teeth, and at the opposite side of the rotational axis from the teeth.

The two slide members 7, 8, see Figure 4, are of similar flat plate form, being generally oblong rectangular with a semi-circular recess 27 at one, inner, end which enables that end to straddle the collar 18 of the pinion. One slide member 7 slides between the toothed portions 16 of gear 5 and the other

slide member 8 slides between the toothed portions of gear 6, the two members being centrally aligned along the housing. Formed in each slide member through its opposite faces is a diagonal slot 28 which is inclined to, and substantially symmetrically bisected by, the central longitudinal axis of the member. The slots 28 of the two slide members are similarly inclined so that they are parallel to one another, each being inclined to the central longitudinal axis of the slide member. At their ends nearest to the recesses 27 of the respective slide members 7, 8 each of the slots has a recess 28' which extends away from the central longitudinal axis of the slide member.

The pins 26 of the gears 5, 6 pass through the slots 28 of the respective slide members 7, 8. By the interengagement of the pins 26 and slots 28 the slide members are moved linearly, in opposite directions, as the gears are rotated by the pinion. In the maximum quarter turn of each gear the pin 26 moves from one end of the slot 28 in the respective slide member to the other. Typically the slide member is caused to travel 25mm. Turning the handle in one direction from the neutral position moves the slide members towards one another to an inner position in which the recesses 27 fit closely about the collar 18 of the pinion, while turning in the opposite direction moves the slide members away from one another. When the handle is released after the slide members have been moved to these positions it is automatically returned by the spring-loading to the neutral position, the lost-motion between the hub and pinion allowing that to happen without the slide members' being moved.

The pins 26 engage in the recesses 28' when the slide members have been moved fully away from one another.

A bolt mounting 29 is fixed to the outer end of each slide member and is presented at the open front 11 of the housing. The mounting 29 has a short integral stake 30 on a flat front face 31 which locates in a complementary hole in an inner end of a respective one of the shoot bolts 9, 10, and a screw-threaded hole 32 into which a screw, not shown, engaged in a second hole in the shoot bolt is screwed to secure the shoot bolt to the slide member for movement with the slide member.

The shoot bolts 9, 10 extend flat along, and beyond, the front of the housing. They are made of rigid metal strip. Outer ends are shaped for engagement with keeper sockets. At an intermediate portion along its length each shoot bolt has an L-shaped stop, not shown, fixed to it on the side remote from the housing.

The fastening of this embodiment is intended to be fitted to a slave door of double doors, which may be sliding or hinged. The fastening is mounted on the upright edge of the slave door against which the other, live, door closes. The housing is set into and secured in a mortice in the door edge and the shoot bolts extend along grooves in the door edge. One shoot bolt 9 runs to the top of the door and the other shoot bolt 10 runs to the bottom edge of the door, the L-shaped stops projecting out of the grooves from the upright edge. Cover plates, not shown, are secured over the grooves and have slots in them through which the L-shaped stops protrude.

In a retracted position of the shoot bolts the slide members are drawn to the inner position about the collar 18 of the pinion. In a shot position of the bolts their outer ends are projected from the top and bottom edges of the slave door for engagement in their respective keeper sockets. The extent of the movement of the bolts between the retracted and shot positions corresponds to that of the slide members, which as stated is typically designed to be 25mm. The engagement of the pins 26 of the gears 5, 6 in the recesses 28' when the bolts are in their shot positions, i.e. when the slide members 7, 8 have been moved fully away from one another, provides positive retention of the bolts in the shot positions to resist retraction of the bolts other than by turning of the handle.

The live door may be fitted with a similar shoot bolt fastening at its adjacent upright edge, operated by a handle which can be locked to secure its bolts in the shot position. Those bolts carry lateral bolt elements which project from the upright edge, and with which the L-shaped stops of the fastening are adapted to co-operate.

When the double doors are closed together and are to be locked shut the fastening of the slave door must first be operated to shoot its bolts, and then the fastening of the live door is operated to shoot its bolts. As the latter bolts are shot the lateral bolt elements are brought into abutment with the stops, which thus prevents the bolts of the fastening on the slave door from being retracted. The handle of the live door fastening can then be locked so that both doors are locked shut.

The fastening described is compact, easily fitted for use, and, since it provides an appreciable extent of travel of the shoot bolts, it is able to provide substantial security of the door to which it is applied.

CLAIMS

1. A shoot bolt fastening of the kind described comprising a housing adapted to be secured at an edge of a window or door, a pinion mounted in the housing and rotatable by the operating handle, a gear rotatably mounted in the housing in mesh with the pinion, a slide member linearly slidable relative to the housing to which the bolt, or one of the bolts, is connected for linear movement therewith, and a pin and slot interconnection between the gear and slide member whereby rotation of the gear by the pinion slides the slide member to move the, or the respective, bolt between the retracted and shot positions.
2. A shoot bolt fastening according to claim 1 in which the relationship between the pinion and gear is such that a quarter turn of the pinion rotates the gear sufficiently for the resultant linear movement of the slide member to move the, or the respective, bolt fully between the retracted and shot positions.
3. A shoot bolt fastening according to claim 1 or claim 2 in which the full extent of the linear movement of the, or the respective, bolt between the retracted and shot positions is at least 25mm.
4. A shoot bolt fastening according to any preceding claim in which the pinion and gear have a common pitch diameter for their meshing teeth.
5. A shoot bolt fastening according to any preceding claim in which the pinion and gear are only partially toothed around their peripheries.

6. A shoot bolt fastening according to any preceding claim in which the pinion and gear each have duplicate, axially spaced, sets of meshing teeth.

7. A shoot bolt fastening according to claim 6 in which the slide member slides between the duplicate sets of teeth of the gear, and the pin and slot interconnection is between the two parts of the gear containing the duplicate sets of teeth and the slide member.

8. A shoot bolt fastening according to any preceding claim in which the slide member is housed within the housing, a guide or guides being provided to guide the slide member in its linear movement.

9. A shoot bolt fastening according to claim 8 in which the, or the respective, bolt extends alongside part of the housing.

10. A shoot bolt fastening according to any preceding claim in which the pin is on the gear and the slot is in the slide member.

11. A shoot bolt fastening according to claim 10 as dependant from claim 7 in which the slot is a through opening in the slide member and the pin extends between the two parts of the gear and through the slot.

12. A shoot bolt fastening according to any preceding claim in which the slot is disposed diagonally to the direction of linear movement of the slide member and is symmetrically intersected, or substantially so, by a plane containing the rotational axes of the pinion and gear.

13. A shoot bolt fastening according to claim 11 or claim 12 in which the slot has a lateral recess in which the pin engages when the bolt has been moved to the shot position, thereby to resist retraction of the bolt other than by turning of the operating handle.

14. A shoot bolt fastening according to any preceding claim in which the pinion and gear are rotatably located in and by complementary recesses formed in the housing.

15. A shoot bolt fastening according to claim 14 wherein the recess in which the gear is located has a journal on which the gear rotates.

16. A shoot bolt fastening according to any preceding claim in which the pinion is mounted on a hub connected to the operating handle and limited relative angular movement is allowed between the hub and the pinion such that the handle is able to be turned through a larger angle of rotation than the pinion.

17. A shoot bolt fastening according to claim 16 in which the relative angular movement allows the handle to be turned through 180° and the pinion to be turned 90° within the movement of the handle.

18. A shoot bolt fastening according to any preceding claim in which the operating handle is spring loaded to a neutral position from which it has to be turned to move the bolt or bolts between the retracted and shot positions.

19. A shoot bolt fastening according to any preceding claim in which there are two of the bolts, one bolt being connected to the slide member and the other bolt

being connected to a second slide member linearly slidable relative to the housing and interconnected by a pin and slot connection with a second gear rotatably mounted in the housing in mesh with the pinion, whereby rotation of the pinion simultaneously operates the two bolts.

20. A shoot bolt fastening according to any preceding claim in which the handle is lockable against turning.

21. A shoot bolt fastening substantially as described herein with reference to the accompanying drawings.

22. A window or door including a shoot bolt fastening as claimed in any preceding claim.



Application No: GB 9520800.5
Claims searched: 1-22

Examiner: Richard Nicholls
Date of search: 13 December 1995

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.N): E2A AAK AMXJ

Int Cl (Ed.6): E05C 9/04 9/08

Other: ONLINE: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	GB0902291A (Crompton) Figure 1	1
A	EP0602323A1 (Fuhr) Figure 1	1

X Document indicating lack of novelty or inventive step
Y Document indicating lack of inventive step if combined with one or more other documents of same category.
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A Document indicating technological background and/or state of the art.
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